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BOTANICAL SKETCHES FROM THE ASIATIC TROPICS

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I. JAPAN

Every botanist who has studied or worked in his favorite science in the temperate zone has wished for a sight of the more luxuriant vegetation of the tropics, with its multiplicity of species, its wealth of vegetative forms, and its varied adaptations to the environment. Sometimes he has the opportunity to gratify his wish, and he is seldom disappointed with the reality. He finds the species just as numerous and as bewildering as he anticipated, and their morphology and ecology just as interesting, yet it is not exactly what he had expected. In the most accessible and convenient parts of the tropics, and these, measured by botanical standards, are the tropics of Asia, he finds that the dense and impenetrable jungle is almost as thoroughly a thing of the past as are virgin forests in eastern America. He soon discovers, also, that the unusual morphological and ecological types are about as widely scattered in space as their analogs in temperate zones, and that most of them can be observed with far greater ease in an American greenhouse. Furthermore, it becomes evident on his first trip into the tropical forest or grassland, or along the seashore, that he must revise to a very considerable extent his early ideas of the vegetation. Every botanist of the temperate zone knows, of course, that palms are seldom a conspicuous part of the tropical forest, that legumes are very abundant, and similar facts of a general nature, but it seems impossible to form from literature a clear mental idea of the actual nature of the tropical vegetation. Whether

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the literature is not sufficiently graphic, or whether the vegetation baffles satisfactory description, is not clear; but the fact remains that the botanist must discard most of his preconceived notions, and form new ideas based on his own observation.

These remarks are not intended to disparage the interesting features of tropical vegetation. They are intended to emphasize that distances are vast and travel slow in the tropics, making observation of the vegetation correspondingly difficult, and that ideas of the tropics gleaned from print are always incomplete and frequently erroneous. Neither is it expected that these sketches will add to our knowledge of tropical botany. They represent merely the impressions gained by a botanical observer in a hasty trip through a small portion of the Asiatic tropics.

It still seems to be a general truth that a plant or an animal loses part of its interest to one who does not know its name. In the exceedingly rich flora of the tropics, the traveller from temperate America recognizes few plants even as to the genus, and turns much of his attention, merely for his own satisfaction, to the cultivated species. So in these sketches, a good proportion of the description must be devoted to the economic botany of the regions visited. In the tropics more native species are in cultivation, and there is a much closer relation between the population and the vegetation, than in temperate climates. The botanist who takes little interest in the economic side of his science while at home soon finds himself sampling the different varieties of native fruits, and visiting the markets and plantations as often as the forests.

On the trip here described, the writer left San Francisco early in September, 1913, and reached the Philippines via Hawaii and Japan. After two months in these islands, he travelled along the coast of Borneo to Singapore and thence to Java. Two months more were spent here, six weeks in Ceylon, and the return voyage was made through the Suez Canal and across the Atlantic, ending in New York in May, 1914.

We landed in Yokohama on September 27, and spent a part of that day and the next at the Botanical Garden in Tokio. One reaches the garden by rickshaw after a ride of nearly an hour

from the chief railway station, through the narrow, crooked, crowded, Japanese streets. On week days tickets of admission to the garden are on sale at a little grocery shop across the street, price four sen (2 cents). On Sundays the regular ticket office is open, and the price is raised to five sen.

There is a broad gravel walk leading from the entrance up a gentle hill to the Botanical Institute, which has its name printed above the door in English. The path is bordered with small lawns and a variety of coniferous and deciduous trees, mostly of familiar temperate zone genera. The effect is broken near the Institute building by a group of cycads, *C. revoluta*, while immediately by the building is a group of tall palms, *Trachycarpus Fortunei*, with *Yucca filamentosa* behind. Farther along stands a group of grass-trees, *Cordyline indivisa*. These and other tropical or subtropical plants scattered through the garden indicate that Tokio is in a semitropical climate, notwithstanding its fairly high latitude. The cultivation of tea and rice shows the same thing, while the frequent solitary banana plants at the edge of the villages remind one of a still warmer climate.

The Institute building is a rather extensive one-story tile-roof structure, not at all Japanese in its architecture. When we entered, students were working in various rooms, some with fresh plants, others with microscopes. On the wall a program was posted in English, giving a schedule of all the classes, including physiology, ecology, and systematic botany. In America their laboratory facilities would be called poor, but the quantity and quality of the research which they produce show that it is at least adequate.

Outside the building, one enters their so-called European garden, with straight gravel paths, trees bordering the walks in rows, and herbaceous plants in geometrical beds. It does look somewhat like some American parks, but if, while in it, one could imagine himself back in America, the illusion would be at once broken by the group of tall grass-trees in the background. The principal walk is lined with the Japanese cherry trees, *Prunus yeddoensis*. These trees are larger than the American cultivated species, but have the typical cherry-like spreading branches and

open crowns. Their bark is also rather cherry-like, but gray rather than brown.

Farther up the garden this formal arrangement is abandoned, and the trees are scattered in groves or groups, very seldom in straight lines. There are some open lawns, but generally beneath the trees the vegetation is composed of wild or semi-wild herbaceous species, or is trampled out by the dozens of children who play in the garden.

Many of the trees are labeled, but enough are left unlabeled to make it tantalizing for the botanist. Probably at least one tree of every species is labeled, but with dozens of new things seen here for the first time, the names are forgotten before another labeled tree of the same species is reached. Once in a while we found a tree of a familiar species, such as *Liriodendron Tulipifera* or *Taxodium distichum*; frequently we recognized the genus, as *Quercus*, *Acer*, or *Aesculus*, but in most cases we did not know the genus at all, or were surprised to read some familiar generic name on the label.

There are maples of all sorts, including one much like our American box-elder. The most abundant, however, is *Acer palmatum*, with a deeply lobed leaf not over five cm. long. We found this species planted commonly throughout southern Japan. Of the oaks, there are some with leaves very much like our red oak, but more with undivided leaves like our shingle oak or chestnut oaks. A large tree of *Aesculus turbinata* looks almost exactly like the European horse chestnut; *Magnolia hypoleuca* reminds one very much of the American *M. tripetala*; and *Rhus semialata* shows no superficial distinction from our *R. copallina*. In other cases the resemblance to American species is not so strong, and we were especially surprised by a large tree of *Cercis sinensis* with crooked, deliquescent trunk and smooth gray bark. Still the general aspect of the tree flora is decidedly North American; and only here and there a tree obtrudes which would look out of place in the northeastern states, such as the palms, cycads, and grass-trees mentioned before, or other small trees with glossy rhododendron-like leaves.

Species of Araliaceae are common, especially *Fatsia japonica*,

with large, orbicular, eleven-divided leaves. These are planted in masses at the edge of groves or against walls. There are some genera represented by good-sized trees, which in America are small and chiefly southern, such as *Illicium* and *Styrax*, and others not native in America at all, such as ginkgo and camphor. The latter reaches a diameter of more than a meter, and has a close but flaky gray mossy bark, a wide-spreading crown, and elliptical acute leaves five cm. long. The huge historic ginkgo tree, which furnished the material for the discovery of motile male gametes, is one and a half meters in diameter, and at the time of our visit was bearing a good crop of the plumlike fruit. There is an immense variety of other gymnosperms, mostly unlabeled, and many deciduous trees entirely unknown to us.

As weeds in or around the garden, there are several species occurring also in America, as *Erigeron canadensis*, *Plantago major*, *Trifolium repens*, and a smartweed, either *Polygonum acre* or something very much like it. Under the forest cover a day-flower, *Commelina*, is very common, with a small grass, like an *Echinochloa* on a small scale, a little mint resembling a *Satureja*, and a liliaceous plant like a Solomon's Seal, but blooming at the apex first, with white and red flowers five cm. across. Most striking of all the herbaceous plants are *Phryma leptostachya* and *Polygonum filiforme* Thunb. The former is of course just like its American form. The smartweed has the general habit of its American analog, *P. virginianum*, with broad clustered leaves and a slender raceme. Its fruit is also of the same structure and explosive at maturity, but is red instead of green. The two species grow side by side in great profusion, just as they do in moist woods in the eastern United States.

The numerous identical or parallel species, the familiar generic names, and the vegetational similarity all combine to make real the close relationship of the floras of Japan and of eastern America, and to show in a striking way something of the present distribution of the arcto-tertiary flora. It was especially obvious that most of the native trees had smooth bark. Since the mild climate of modern Japan is something like that of the Miocene period, it is entirely possible that the arcto-tertiary vegetation of that time was typically smooth-barked.

In a valley at the farther end of the garden, shut off by the hills from the rest, is the Japanese garden. There is scarcely a foot of level ground in it. There are small ponds with lilies, lotus, and goldfish; crooked pines with their branches spreading horizontally over the water and supported there by props; cedar trees trimmed into fantastic shapes or trained to cover the rocks; rustic bridges, and paths running in every direction over the hillsides. Japanese children in picturesque garments play solemnly on the paths, or feed the goldfish with cakes which they have bought from an equally picturesque old woman. The place is absolutely un-American in every respect, and there is not a single bed of blooming plants within it.

The following day, September 29, we left Yokohama for Kobe by rail, a distance of nearly four hundred miles through charming scenery. At close range, nearest the railroad, are the cultivated fields, leading up quite naturally to the villages behind at the foot of the hills, while the mountains form a natural background to the whole scene.

The mountains rise steeply and abruptly from the edge of the valleys, with rough irregular slopes and a very broken skyline. They are green from bottom to top, not with the uniform tone of an American forest, but with various shades caused by the light-green bamboo, the emerald green rice, the dark pines, and other plants. Then one reaches a valley and has an instant's glimpse up its course for a mile or so, the hills coming down steeply on each side, and its bottom covered with a narrow curving strip of rice, rising in terrace above terrace up the valley. Usually there is a stream in the valley, with its banks enclosed in masonry and with a huge undershot wheel, half hidden by a bamboo thicket, barely turning in the slow current.

The railway crosses many rivers on immense bridges, three of them over half a mile long. During September the amount of water in them is small, and sometimes almost hidden by fishing boats, but their immense beds, covered with boulder bars, show at once both the great rainfall of southern Japan and the effect of deforestation on the mountains behind. The river beds are always diked in, and so thoroughly that a flood apparently

never breaks over. Even the railroad crosses the flood-plain, if such it can be called, without any embankment, climbs a grade to the bridge, and drops off again at the other end. But these dikes are not made of alluvial mud, like those along the Mississippi River, but of stone, and several centuries of experience have evidently taught just how high it is necessary to make them.

The view of Japanese agriculture from the train window is most interesting. After the twelve-hour ride, three impressions stand out at once above all others: the limited amount of agricultural land available, the closeness of its cultivation, and its wonderful fertility.

The railway naturally follows the easiest route, thereby crossing the most extensive areas of flat land and avoiding the mountains as much as possible. Still, hills too high or too steep for cultivation are in view from the track every mile of the way, and in most places they rise to genuine mountains, cutting off completely the view to the north. The arable land borders the rivers, occupies the narrow coastal plain, when there is any, and extends up the narrow intermontane valleys. In places the cultivated strip appears to be ten miles wide, but it averages much narrower, and there seems to be an interminable area of mountains behind it.

Of this arable land, a wonderfully large proportion is in cultivation. The railroad, of course, cuts a strip through it, but there is no marginal right of way, as in America. The villages and lanes take up space, but nothing is wasted on dooryards in the former, or on width in the latter. The lanes are seldom more than six feet wide, usually less, and the fields come right to the beaten track, without any fence or hedge. In the villages, there is a fence around most houses, or between them, and usually a row of trees along the lanes. Sometimes there is a hedge, but it is composed of a mixture of species, and apparently has its own economic value. There are many small groves, seldom more than a city lot in size, surrounding the Shinto shrines or sometimes around the small cemeteries. There are numerous small ponds, but these are usually planted to lotus, and, whether planted or not, are used for carp cultivation. The sides of the

streams are walled up, and the streams themselves are used for fish, power, and irrigation; the sides of the hills and railroad embankments furnish hay, and the groves afford building material and fuel. Ordinary woods, in the American sense of the word, are unknown, at least near the railway track, and a wild flora is never seen from the train, except along the flood-plains of rivers subject to frequent overflow. In short, all the arable land is used. Farther back from the railway, at the edge of the hills, the narrow valleys have been flattened out and terraced; the sides of the hills have been terraced whenever possible, and in many places so steeply that masonry retaining walls are necessary. The groves of pine and bamboo are usually on the hillsides, probably occupying areas too rocky for agriculture, but the terraces sometimes extend a thousand feet above the valley.

Since rice must be flooded at certain times, the fields must be perfectly level. The valley land is not perfectly level, and is consequently divided off into small fields separated by low earth walls. One seldom sees a single field more than an acre in extent, and they will not average a hundred feet on a side. Their sides are straight or rather regularly curved, so that the whole area appears laid out in geometrical fashion. In corners and narrow valleys, or on steeper slopes, the fields become progressively smaller, and we saw one in the shape of a triangle six feet on a side, containing about eighteen square feet. But it was carefully planted to rice and had its regular earth ridge surrounding it.

Even the earth ridges are cultivated. Standing above the wet rice fields, they will support a different sort of crop, and are usually planted to beans, whose dark-green foliage stands out very clearly against the light-green background of rice. In some cases they are planted with sorghum, or with plants of beans and sorghum alternately, or still more rarely with buckwheat.

If there are any weeds, they are invisible from the train. On the whole trip from Tokio to Kobe not one weedy plant was seen rising above the rice fields. Probably there is none, because the soil is too precious to waste on anything of no value.

The fertility of the soil is scarcely open to description. At the time of our visit, the rice was short, two to three feet high, but wonderfully dense; the buckwheat fields were absolutely white with blossom; the trees of persimmon, chestnut, and russet pears were bending with fruit; the soy beans, pulled up whole and offered that way in the markets, were crowded with pods. And the land must needs be fertile to support the dense population, which appears to be almost one continuous village.

(To be continued)

ROSA NUTKANA

BY J. K. HENRY

This paper aims to present some of the variations of *R. nutkana* as it grows near the coast of southern British Columbia. No account is taken of those forms with simply serrate, mostly eglandular leaflets, which occur at Shawnigan, Vancouver Island, and Spence's Bridge, and which are possibly referable to *R. meleina* Greene, a species reduced to synonymy by Dr A. Nelson. All the forms here examined have doubly serrate leaflets glandular beneath, and more or less glandular calyx and peduncles.

In the neighborhood of Vancouver and Elgin (near Blaine, Wn.) this rose has stout stems 1-3 m. high, at base either naked or densely clothed with rather weak somewhat retrorse prickles. The ordinary prickles vary from narrowly lanceolate to broadly triangular, are usually in pairs or more or less scattered, but often as shown in Figs. 2 and 11 more or less grouped. Such grouping, however, does not appear to be concomitant with other variations, and often occurs in a less marked way. So, too, the broadly triangular prickles may occur with very different fruit-forms,—with subglobose in Fig. 10 and strongly flattened in Fig. 9. Recurved prickles are not at all rare, sometimes occurring with the straight, sometimes (Fig. 8) giving character to a clump.

This species flowers on the flats at Elgin about the end of the first week in June; on dry slopes near Vancouver with a favorable exposure, about fifteen days earlier. The flowers vary in